

DE 33 31 007 C1Television receiver device in conjunction with a text decoder, such as an on-screen text or teletext decoder

The invention relates to a television receiver device with switchable horizontal and vertical oscillators and with a receiver circuit for reception of HF-modulated television signals and for conditioning the said signals, as well as picture signals from a picture recording device or from another recording medium, for display on the screen by means of the electron beam which scans the screen in conjunction with a text decoder, such as an on-screen text decoder or teletext decoder, for signal conditioning of received encoded lines, graphics and symbols which are displayed in page form on the same screen.

It is known to use the television receiver in conjunction with the telephone and a data centre installed in the postal service for new possibilities for communication in the form of the display of texts, graphics and symbols, wherein the text data is transmitted in digitally encoded form via the telephone line. Moreover, it is known to transmit text data during the vertical blanking intervals of the television signal and to condition these data by way of a dedicated decoder in the television receiver device and to buffer them in page form in such a way that they can be reproduced on the screen. The known systems are described in NTZ, Volume 34, 1981, issue 11, pages 776 to 780. The domestic and foreign systems currently being trialled or already introduced are: Teletel, Prestel, Captain and the German on-screen text and teletext systems.

A decoder for the preparation of on-screen text signals is described in the earlier Patent Application P 32 23 489. With regard to the requirements for text display on the television receiver device the same criteria apply to both the on-screen text decoder and the text decoders for the other systems. In particular for professional use of such devices there is a requirement that flicker-free perception should also be guaranteed in the lateral field of view. In order to avoid flickering the picture element repetition frequency must lie above the no-flicker frequency. The no-flicker frequency is principally dependent upon the average luminance of the screen, the afterglow of the fluorescent substance, the size of the screen and

the position of the screen in the field of view. In this case flickering in the lateral field of view is perceived as more disturbing than flickering in the central field of view. Flickering can be counteracted for example by altering the installation, changing the room illumination or by measures undertaken on the device, such as increasing the afterglow of the fluorescent substance or increasing the picture element repetition frequency.

It is known that television pictures according to the CCIR standard are transmitted and displayed at a frame rate of 25 Hz and television pictures according to the FCC standard (USA, Japan) are transmitted and displayed at a frame rate of 30 Hz by interlacing. Each of the frames consists of two fields with straight and crooked lines. The vertical frequency according to the CCIR standard is 50 Hz, the picture being formed by 625 lines. On the other hand, according to the FCC standard the vertical frequency is 60 Hz. In the case of moving pictures, such as are usually offered by a television broadcast, the fields merge into one another, so that the viewer does not notice the error effect of the picture tube which is present at the low frame rate. In the case of pure text display the flicker effect has a particularly disadvantageous effect. If the text pages are displayed by interlacing this causes an interline flicker which is perceived as very unpleasant. Even in the case of display of frames by line offset and overwriting of congruent lines, with the resulting coincidence between the vertical frequency and the picture frequency of 50 Hz a troublesome surface flicker is noted, which can lead to signs of fatigue in the viewer's eyes.

The object of the invention, in a television receiver device which is or can be combined with a text decoder of the type described in the introduction, is to provide such a circuit device so that a flicker-free reproduction of the text image is enabled without the television reception being impaired in any way. Furthermore, an increase in the picture repetition frequency should be enabled by simple means without a change to the line deflection and horizontal generators of the television receiver device. A solution is also sought which enables a mixed operation between the display of a television picture and text display without jitter occurring in that case.

The object is achieved according to the invention by the technical teaching set out in Claim 1.

Advantageous embodiments of the invention are described in greater detail in the subordinate claims.

DE-OS 23 60 596 discloses a dual-standard receiver circuit for a television receiver device with a regulated voltage source for horizontal and deflection generators with a switchable horizontal oscillator to which different operating voltages can be applied according to the line standard selected.

For the purpose of switching over to the various television standards, in this case 625 and 819 line image at a picture repetition frequency of 25 Hz, a double-pole switch with an earthed switch arm and two controlled semiconductor switches of opposing conductivity type are provided, of which the first operates as a ballast resistor of the horizontal oscillator and the other operates as a dropping resistor of the vertical generator, the bases of which are connected to one operating contact of the switch, whilst the other operating contact is connected to a voltage divider which influences the output voltage of the regulated network device in such a way that in one position of the switch an increased operating voltage, an increased oscillator frequency, a reduced tangential capacitor and a vertical amplitude which is constant in relation to the increased operating voltage is maintained, whilst in the other position the value corresponding to the lower line standard is maintained. The fundamental problems in multi-standard devices are known from this document. However, with regard to the subject matter of the invention it does not disclose any suggestion as to how the switchover is to be accomplished when the television receiver device is used simultaneously as a text reproduction device.

DE-AS 23 51 817, which is also known, also does not disclose the object of the present invention nor a suggestion which could lead to the subject matter of the invention.

In this document a line end stage for a multi-standard television receiver device is described in which the first power supply connection of the output stage is connected to an operating voltage source and the second power supply connection is connected to a further operating voltage source, whereby the operating voltage which is effective at the output stage is switched over as the line frequency is switched over. During standard switchover the

operating voltage is switched so that the amplitude of the deflecting current for generation of a constant image remains constant at the sweep generator while the connected impedances are maintained. However, in practice switching over of the operating voltage is substantially possible only with an electronically stabilised mains-powered device, e.g. a blocking oscillator power supply unit, such as is usually employed in the modern television receiver devices as a power supply source.

Both described circuits for multi-standard devices assume that a switchover takes place manually, whereby the corresponding voltages and frequency switching of the synchronisation are carried out. A teaching in relation to use for the display of flicker-free text pages is not disclosed in these documents.

The invention discloses a solution for designing a television receiver device without changing the power output stages (horizontal and vertical deflecting generators) so that a flicker-free text reproduction of the decoded text data received from a text decoder is enabled. In this case the invention assumes the use of both the on-screen text service, in which the encoded data are transmitted via the telephone network, and such a system in which the text data are transmitted in the vertical blanking interval.

With regard to the invention it is preferable to use such mains-powered switching parts which have a transformer, from the secondary windings of which the operating voltages for power supply of the deflecting generators with their appertaining oscillators and the signal-processing circuits for the television signals as well as the text signals are collected. Such mains-powered switching parts are generally known as mains-powered switching regulator devices. By means of an additional secondary winding it is possible in a simple manner to increase the operating voltage for the horizontal sweep generator at a changed line frequency and constant number of lines of the picture and an increased frame rate or in the reverse case to reduce it by switching off the additional winding so that the conditions relating to the stated object are maintained in relation to the return voltages. When other stabilising mains-powered switching parts or stabilising circuits in mains-powered parts *per se* are used, care must be taken to ensure that the different operating voltages for the two different operating states are available to be tapped.

The invention is explained in greater detail with the aid of the block diagram shown in Figure 1 and the simplified wiring diagram shown in Figure 2.

For explanation of the invention Figure 1 shows the principal components in a television receiver device which is combined with a text decoder. On the input side a mains-powered device 1 is provided which is connected via the connecting terminal 2 to an alternating current mains supply. The regulated mains-powered switching part 1 generates the various operating voltages necessary for the supply of the circuits of the television receiver and of the text decoder 16. Use is preferably made of a mains-powered switching part with a blocking oscillator which has a transformer, from the secondary windings of which the corresponding operating voltages can be tapped. In the illustrated embodiment the voltages U_{B0} is applied as supply voltage to the vertical deflecting generator 3, and the voltage U_{B1} and the voltage U_{B2} are applied as supply voltage by corresponding switching by means of the switch 4 to the horizontal output stage 5.

As the vertical output stage 3 an integrated combination module TDA 2653 A is used, by which the deflecting current necessary for the vertical deflection of the beam current is output in amplified form to the deflection coils LV . In order to regulate the amplitude of the deflecting current a further integrated switching circuit TDA 3576 (6) is provided which is combined with a synchronised oscillator and internally enables switchover of the vertical frequency from 50 to 60 kHz. The horizontal pulses of 15.625 kHz or 18.75 kHz which are necessary for the horizontal synchronisation when the number of lines to be displayed on the screen remains constant are generated in the same component and are output via the connection 7 for controlling the horizontal output stage 5. The vertical synchronisation pulses are supplied to the vertical output stage 3 via the line 8.

The horizontal output stage 5 generates the necessary deflecting current in the horizontal deflection coils LH according to the applied horizontal frequency output via the line 7.

The signals received by the antenna are delivered to a television receiver circuit 10 comprising a tuner and an intermediate frequency amplifier connected downstream. Also

present at the output of the intermediate frequency amplifier in addition to the sound intermediate frequency is the picture intermediate frequency which is delivered via the connection 11 to the signal-processing circuits of the television device which are not shown or designated here. Simultaneously therewith these signals are also applied to a clipper of an integrated circuit TDA 2594 in which by means of coincidence circuits it is established whether or not a television signal is received via the antenna. In the case where a television reception signal is present an identification signal (mute) is output as a positive pulse via the output 12. On the other hand, in the case where a television signal is absent the potential 0 is applied to the output 12. The significance of this identification signal in relation to the teaching of the invention will be discussed later.

Furthermore, in the television receiver an operating mode selector switch 13 is provided which can be switched over selectively from one mode of operation to another by means of input control commands from a local control on the television device or by means of a remote control command from a remote control transmitter which is supplied via a receiver. This is illustrated symbolically by the three inputs: television reception mode (*FS*), on-screen text mode (*BTX*) and mixed operation (*Mix*).

Whilst the components 14 and 13 can still be associated with the television receiver device, the oscillator 15 provided according to the invention belongs to the on-screen text decoder 16, since the latter is required for the execution control of the on-screen text decoder both for acceptance of encoded text data via the telephone line 17 and also for conditioning the encoded signals and decoding them as well as for readout for display. The frequencies output by the oscillator 15 serve *per se* for control of the execution function of the *BTX* decoder. For display of the text data on the screen the oscillator 15 can be switched over, in this embodiment from 12 MHz at a vertical frequency of 50 Hz to 14.5 MHz at a vertical frequency of 60 Hz.

It may be assumed that first of all normal television reception takes place via the television receiver. For display it is necessary for a corresponding setting command to be present at the input *FS* of the operating mode selector switch 13. The operating voltage U_{BI} is connected to the horizontal output stage. In the same way the shunt 18 is switched so as to be inactive

parallel to an impedance 19 which determines the oscillator frequency of the horizontal oscillator, the switch contact 20 being put into the illustrated position. However, in this embodiment this does not take place via the television operating signal FS but via the identification signal present upon reception of a television signal, since only the received television signals are displayed. Synchronisation of the horizontal oscillator takes place through the received horizontal synchronisation pulses. In the same way synchronisation of the vertical oscillator integrated in the component 3 is also guaranteed as a function of the horizontal pulses. The signal paths and the conditioning of the received synchronising pulses which are necessary for this are not shown in greater detail. They are generally known and can be found for example in the reference book "Fernsehtechnik ohne Ballast" [*"Television technology without ballast"*] by Linann/Pelka, 14th edition.

In order to switch over to on-screen text mode, in which digitally encoded characters received via the telephone network are displayed on the screen, it is necessary for a *BTX* control command to be applied to the operating mode selector switch, wherein the said command acts via the operating mode selector switch 13 so that on the one hand the selector switch 4 switches to the operating voltage source U_{B2} and on the other hand the television signals which are also received are switched so as to be inactive via the electronic switch 22 which is connected to earth. Simultaneously a switching voltage is applied via the signal line 23 to the switchable oscillator 15 and switches the oscillator in such a way that the output frequency increases, e.g. to 14.4 MHz. The vertical and horizontal synchronising pulses which are necessary for synchronous display of the page characters are generated from the division of this frequency. The switching command is also applied to the electronic switch 20 via the control line 24 shown by broken lines and the control line 21, as a result of which the switch switches over and the shunt 18 is closed parallel to the frequency-determining impedance 19. Thus the horizontal frequency changes from 15.625 kHz to 18.75 kHz with the same number of lines in a picture. At the same time the vertical frequency also changes the vertical frequency from 50 to 60 Hz by internal signal conditioning.

The text data associated with the lines and pages and stored in the memory of the decoder 16 are forced out via the output 12 by the synchronising pulses emitted by the oscillator 15. The

synchronising pulses are delivered in parallel via the control line 26 to the horizontal oscillator and the vertical oscillator for synchronisation thereof.

In the "mixed operation" mode, which can be selected by applying a control command to the "mix" input of the switch 13, the received television picture and the received text page are displayed simultaneously. The receiver circuit is switched to active by opening of the contact 22 and by switching over of the operating voltage switch 4 to the operating voltage U_{BI} for television mode. Since the identification signal component 14 recognises via an integrated clipper and a coincidence circuit that a television signal is present, it emits a mute identification signal via the output 12 which automatically switches the switchable oscillator over to the frequency which is necessary for television picture synchronisation. With this frequency the text contents are read out from the memory of the *BTX* decoder and superimposed on the displayed television picture. In this case it is ensured by the synchronising pulses applied by the television signal that the oscillator 15 which is free-running *per se* is synchronised by the synchronising pulses. The switchover of the operating voltage selector switch 4 can also take place as a function of the mute identification signal. The same also applies to the switchover of the horizontal/vertical oscillator 6 of the television receiver circuit.

In order to be able to inlay the text pages with congruent lines in terms of picture repetition frequency when a television picture is displayed by interlacing, a further frame recognition circuit (not shown) is necessary. With the selected frame, e.g. the first one to start, the synchronisation of the free-running oscillator 15 must then be changed and synchronised by the reception synchronisation signals in such a way that a line change takes place from frame to frame in such a way that the text data are written with congruent lines without a line offset due to the interlacing. As a result the flicker effect for the display of the characters can be avoided in this mode of operation.

An equipment-linked design of a circuit arrangement for an enforced switchover of the synchronisation of the free-running oscillator 15 according to Figure 1 for a *BTX* decoder is illustrated in the form of a wiring diagram in Figure 2, wherein the components are disposed

on supplementary boards 30/40 which are inserted – also subsequently – into the device chassis of the television receiver device as well as the on-screen text decoder.

The television signal recognition component 14 according to Figure 1 is also denoted by 14 in Figure 2. If the TDA 2594 is used for this which as a function of an applied signal recognises whether a television signal provided with synchronising signals is present and if this is established emits an identification signal in the form of a mute pulse via 39. When a television signal is present the pulse represents a logical 1, when it is absent the pulse represents a logical 0. The voltage which reproduces the conditions controls the transistor 31 in such a way that it switches to disabled when the logical 1 is present, so that the voltage 0 is present at the collector thereof. The voltage assigned to the logical command is delivered via the diode 32 and balancing series resistors to the central tap of two series-connected capacitance diodes 33 and 34. Therefore a voltage tapped from the voltage source +5V is applied via the resistor 35 to the central tap and sets the capacitance diodes 33 and 34 to a specific capacitance value. The parallel connection circuit formed by the capacitance diodes and the parallel-connected coil 36 oscillates at 12 MHz. These oscillations capacitively coupled to the inputs 38 and 42 of the divider which generates horizontal and vertical pulses. Thus synchronisation is ensured with the simultaneous reproduction of text and television picture.

The control voltage of 0V applied is also delivered simultaneously to the switching transistor 41 on the additional board 40 which is an n-p-n doped transistor and is disabled. The winding of a relay 43 is switched in series with the collector and via a dropping resistor is at the operating voltage U_{27} which is tapped by the secondary winding 44 of a mains-powered switching part which is not shown in greater detail and operates according to the switching regulator principle and is rectified by the diode 45 and smoothed by means of a filter capacitor 46. Since the transistor 41 is disabled no current can flow through it. Therefore the relay 43 does not pull up. The operating contact is opened. Thus the winding 48 of the transformer remains inactive for the power supply to the horizontal deflecting oscillator. The operating voltage U_B is tapped by the winding 44 and rectified by the diode 49 and is applied to the sweep generator. Since the control signal 0V is present at 50 Hz vertical frequency, the transistor 50 which continues to be controlled thereby and is a n-p-n transistor also remains

disabled. The base thereof is also controlled by the control voltage. Consequently the resistors 51, 52 switched into the collector to emitter path remain inactive, so that the oscillation frequency of the horizontal oscillator 6 in the component TDA 3576 is determined by the impedances 53 and 54 which determine the frequency. This amounts to 50 Hz and is synchronised by the synchronising pulses of the received television signal.

On the other hand the behaviour is different if the television reception signal is switched of or is not present. In this case the logical 0 is present at the output 39 of the component 14 so that the p-n-p doped switching transistor controls conductively. This operation is designed for 60 Hz picture repetition frequency, so that a voltage of 12V can be tapped at the collector output of the transistor 31. Thus, however, the switching voltage is applied via the diode 32 to the common connection point of the capacitance diodes 33/34 as the voltage which changes the capacitance of the capacitance diodes 33/34. The capacitance is changed in such a way that the oscillatory circuit still oscillates at 14.5 MHz. The frequency is divided by the divider 37 into vertical and horizontal synchronising pulses which for readout of the memory of the *BT* decoder are applied thereto. At the same time the control voltage is delivered to the switching transistors 41 and 50 which each switch to conductive. The relay 43 pulls up so that the contact 47 closes. Thus the additional winding 48 is fully active for generation for the horizontal oscillator, sweep generator, whilst the diode 49 is enabled and acts as decoupling diode. In the same way the resistors 51, 52, of which the resistor 51 is adjustable, are switched parallel to the resistor 54 which forms the impedance which determines the frequency for the horizontal oscillator. Therefore this also oscillates at the changed frequency, namely 18.75 kHz. With the aid of the wiring diagram shown in Figure 2 it can be seen that by simple means a television receiver device which can be combined with an on-screen text decoder or also with a teletext decoder can be converted for the increased picture repetition frequency display in the display of text. When teletext signals are received the mute circuit is exclusively replaced by a control command "teletext mode", whereby teletext signals can be read out of the buffer memory at an increased frequency, namely 60 Hz picture repetition frequency.

Claims

1. Television receiver device with switchable horizontal and vertical oscillators and with a receiver circuit for reception of HF-modulated television signals and for conditioning the said signals, as well as picture signals from a picture recording device or from another recording medium, for display on the screen by means of the electron beam which scans the screen in conjunction with a text decoder, such as an on-screen text decoder or teletext decoder, for signal conditioning of received encoded lines, graphics and symbols which are displayed as pages on the same screen, characterised by the following features:
 - a) The text decoder (16) is clocked by a free-running switchable oscillator circuit (5) which generates horizontal and vertical pulses which during reproduction of the television picture are synchronised with the received synchronising pulses of the television signal, wherein during exclusive text reproduction operation the said oscillator circuit (15) can be switched over to such a frequency that the vertical and horizontal pulses which can be tapped by it have a higher frequency than the synchronising pulses of the television signal.
 - b) During actuation of a local operating switch on the television device, by way of an operating mode selector switch (13) or by means of a remote control signal the television signals are selectively switched off and the text signals for display are switched through to the signal-processing circuits of the television device, whereby simultaneously the switchable oscillator (15) of the text decoder (16) is switched over to the higher frequency and the outgoing synchronising pulses control the horizontal and vertical deflection circuits (3, 5, 6) of the television receiver device.
 - c) In the text reproduction mode the vertical frequency is of equal magnitude to the picture repetition frequency.
 - d) In the text reproduction mode the parts of the screen scanned by the electron beam are written congruently.

- e) As a function on identification signal derived from the received television signal with selective simultaneous display of the television picture and a text page (mixed operation) a priority circuit (14) switches the oscillator (15) of the text decoder (16) over to the lower frequency, whereby the generated horizontal and vertical pulses are synchronised by the synchronising pulses of the television signal.

2. Television receiver device as claimed in Claim 1, characterised in that the control oscillators (6) for the vertical and horizontal deflection circuit (3, 5) of the television receiver device are self-sustaining switchable oscillators and that they oscillate at the frequency assigned to this mode of operation as a function of the control command or switching over to a specific mode of operation, and that the vertical or horizontal synchronising pulses emitted by them are either synchronised by the synchronising pulses of the received television signal which is switched through or are synchronised by the synchronising pulses emitted by the oscillator (15) of the text decoder, whereby the memory contents of the text memory containing the display data are read out in the same chronological sequence.

3. Television receiver device with a regulated voltage source for the horizontal and vertical sweep generators with switchable horizontal oscillator and horizontal operating voltage for the sweep generators and with a receiver circuit for reception of HF-modulated television signals and for conditioning the said signals, as well as picture signals from a picture recording device or from another recording medium, for pictorial display on the screen in conjunction with a text decoder according to Claim 1 or 2, characterised by:

a constant line flyback of the electron beam which scans the screen during television and text reproduction operation,

a further switch (4) which is connected in parallel to the selector switch (13) of the oscillator (15) of the text decoder (16) and by way of which various operating voltages are switched through from the regulated voltage source (1) with an unchanged line end stage and constant deflecting current,

and by a synchronisation of the vertical oscillator (6/3) of the television receiver device with the vertical synchronising pulses assigned to the mode of operation.

4. Television receiver device as claimed in any one of the preceding claims, characterised in that an identification circuit is provided for recognition of the respective fields of the television picture transmitted by interlacing and to be displayed, wherein in a manner which is known *per se* the identification circuit determines the first or second frame with reference to the position relative to each other of the pre-pulses, frame pulses or after-pulses of the television synchronisation signal of the two fields forming a frame, and that in mixed operation the picture repetition frequency for the text display is synchronised with the vertical frequency of one of the fields in such a way that the frames of the text pages are written congruently with the lines of the selected one of the fields.

5. Television receiver device as claimed in any one of the preceding claims, characterised in that the frequency of the synchronising pulses in exclusive text reproduction is increased by 20 to 25% relative to those of the transmitted television signals.

6. Television receiver device as claimed in Claim 5 for reception of television signals according to the CCIR standard (interlacing, picture repetition frequency 25 Hz, vertical frequency 50 Hz, number of lines 625 lines, line frequency 15.625 kHz), characterised in that for the exclusive text display whilst the number of lines is maintained the picture repetition frequency is increased to 60 Hz and is equal to the vertical frequency, and that the line frequency with a constant number of lines is raised to 18.75 kHz, wherein the memories of the text decoder in which the display data are stored in a character- or dot-oriented manner are read out with the line frequency.

7. Television receiver device as claimed in any one of Claims 3, 5 or 6 with a switching power supply device for generating constant operating voltages which has a transformer with primary and secondary windings and a feedback winding as well as an electronic switch and a control circuit which regulates the frequency of the switching power supply device, characterised in that in order to increase the operating voltage for text reproduction operation a switchable further secondary winding (48) is provided in the transformer and in text

reproduction operation this further secondary winding can be switched in series with the secondary winding (44) to generate the supply voltage for the horizontal sweep generator in television operation by way of a switch contact (4, 47).

8. Television receiver device as claimed in Claim 7, characterised in that the connection point of the two secondary windings (44, 48) is connected to the sweep generator by way of a series-connected decoupling diode which simultaneously forms the rectifier diode, and that the second pickup of the additional winding (48) is also connected to the voltage supply input of the deflection circuit by way of a rectifier diode (55) and the switch contact (47).

9. Television receiver device as claimed in any one of the preceding claims, characterised in that by changing the impedances (53, 54) which determine the frequency the vertical oscillator and the horizontal oscillator are changed during text reproduction in such a way that the vertical pulses are synchronised with the higher frequency and control the vertical output stage, and that the horizontal synchronising pulses control the line deflection generator whilst constant kickback times are maintained.

10. Television receiver device as claimed in any one of the preceding claims in conjunction with a teletext decoder which conditions the text data transmitted during the vertical blanking intervals of the television signal and buffers them in page form in order to be able to display them on the screen so that they can be read out repeatedly, characterised in that the oscillator of the text decoder is synchronised by the received synchronising pulses, and that the text pages to be displayed are read out at the synchronised line frequency and are displayed in page form in the synchronised vertical frequency.

11. Television receiver device as claimed in any one of the preceding claims, characterised in that there is provided in the device a remote control receiver which receives the control commands to be emitted by a remote control transmitter according to the mode of operation to be selected and which emits the control commands for switching over the oscillator of the text decoder and optionally the oscillators of the television receiver device and also switches off the television signal input during text reproduction and connects the operating voltage assigned according to the mode of operation.